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MISSOURI UNIV-ST LOUIS DEPT OF PHYSICS
POTENTIAL LASER ACTION IN HE-METAL VAPOR MIXTURES. (U)
NOV 80 J J LEVENTHAL

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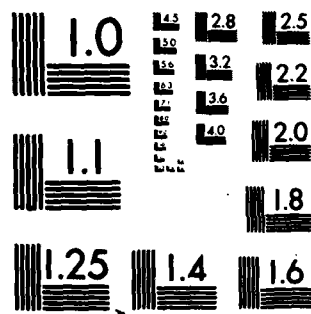
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Research Summary

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7. AUTHOR(s)

Jacob J. Leventhal, Professor of Physics

8. CONTRACT OR GRANT NUMBER(s)

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Excited State Production
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Cross sections for excited state production in ion-molecule
collisions have been measured by observing radiation
resulting from decay of the excited species. Recent work
involving collisions of He⁺ with Li is discussed.

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November 1980

Research Summary: ONR Contract No. N00014-76-C-0760

"Potential Laser Action in He-Metal Vapor Mixtures"

1. Principal Investigator: J. J. Leventhal
Professor of Physics
✓ Department of Physics
University of Missouri - St. Louis
St. Louis, Missouri 63121
2. Contract Description: Experimental studies of inelastic atomic and molecular collision processes. Such processes can selectively populate excited states of the product species, and may thus be potential sources of population inversions capable of producing laser action.
3. Scientific Problem: The most important aspects of this work are to determine the fundamental rules that govern internal energy level population in molecular collisions. Using the experimental technique developed at UMSL for the study of such processes, specific collision systems can be tested for promise as lasers.
4. Scientific and Technical Approach: The experiments are performed by combining molecular beam techniques with those of emission spectroscopy. A low energy mass selected ion beam is intersected by a thermal energy atomic or molecular beam. Photons from radiative decay of excited product species are dispersed and detected thus providing an emission spectrum that is characteristic of the energy transfer process. This spectrum directly provides the desired information.
5. Progress: During the past contract period an important apparatus modification, the incorporation of grazing incidence spectrometer capable of dispersing radiation at soft x-ray/xuv wavelengths (250-600Å), was completed, tested and calibrated. Preliminary results of a collision system that shows promise for x-ray super-radiance, $\text{He}^{++}\text{-Li}$, were reported.
6. Publications:
 1. "Soft x-ray emission from $\text{He}^{++}\text{-Li}$ collisions", J. L. Barrett and J. J. Leventhal, Appl. Phys. Lett. 36, 869 (1980)
 2. "Selective formation of $\text{He}^+(n=3)$ in $\text{He}^{++}\text{-Li}$ collisions", J. L. Barrett and J. J. Leventhal, Phys. Rev A (in press)
7. Extenuating Circumstances: None
8. Unspent Funds: None
9. Graduate Students: None
10. Other Federal Support: DOE \$59,000 June 1, 1980-May 31, 1981

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